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**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Appl. No : 10/815,727 Confirmation No. : 9476  
Applicant : John D. Brennan et al.  
Filed : April 2, 2004  
Title : METHOD OF IMMOBILIZING MEMBRANE-ASSOCIATED  
MOLECULES  
TCJA.U. : 1641  
Examiner : Unsu Jung  
Docket No. : 3244-127 (Formerly 571-933)  
Customer No: 001059

Honorable Commissioner for Patents  
P. O. Box 1450  
Alexandria, Virginia 22313-1450

Dear Sir:

**DECLARATION UNDER 37 CFR §1.132**

I, Michael A. Brook, a citizen of Canada, and resident of Ancaster, Ontario, Canada, declare that the following facts are within my knowledge and are true.

1. I reside at 165 Charterhouse Crescent, Ancaster, Ontario, Canada L9G 4M4.
2. I currently am a Professor in the Department of Chemistry, McMaster University, 1280 Main St. W., Hamilton, Ontario, Canada, L8S 4M1.
3. I have been working in the area of organic, polymer and materials synthesis utilizing silicon chemistry since 1980. My curriculum vitae is attached to this Declaration as Exhibit A.

**BEST AVAILABLE COPY**

4. I am an inventor, along with Zheng Zhang, Yang Chen, Jorge Cruz-Aguado, Richard J. Hodgson, Dina Tleugabulova and John D. Brennan, of the subject matter as claimed in U.S. Patent Application No. 10/814,123 filed April 4, 2004 (hereafter "the Application").

5. I have read and understood the disclosure and claims of the Application.

6. I have read and understood the Office Action that issued on the Application on May 17, 2006. The Examiner is of the view that claims 1-5, 8-10, 38, 40-45 and 47-48 are obvious over Nakanishi688 (US 5,009,688) in view of Gill (J. Am. Chem. Soc., (1998), 120, 8587-8598), claims 1-5, 8-10, 40-45, 47-52, 54-55 and 56 are obvious over Nakanishi875 (US 5,624,875) in view of Gill, claim 38 is obvious over Nakanishi875 in view of Gill and as evidenced by Barkin (US 3,374,103) and claims 53 and 57-61 are obvious over Nakanishi875 in view of Gill.

7. I have read and understood the claims that are attached to this Declaration as Exhibit B that I understand the Applicants are filing in response to the Office Action dated May 17, 2006. My comments below are based on the amended claims in Exhibit B (hereinafter "the amended claims").

8. The Applicants have developed a biomolecule compatible method of preparing bimodal siliceous materials having a meso/macroporous structure that is suitable for chromatographic applications by combining polyol-modified silane precursors with one or more water soluble polymers under conditions where a phase separation occurs before gelation, wherein said conditions comprise combining polyol-modified silane precursors with one or more water soluble polymers at a pH in the range of about 4 to about 11.5.

9. Nakanishi688 describes methods of preparing siliceous materials with controlled pore size by combining alkoxysilanes, or oligomers thereof, and a

water soluble polymer, under conditions where phase separation occurs before gelation. Nakanishi688 does not teach that the resulting materials are bimodal, i.e. that they have a meso/macroporous structure. The materials prepared using the method taught in Nakanishi688 are only described as "porous".

10. Nakanishi875 describes methods of preparing siliceous materials with a bimodal meso/macroporous pore structure by combining alkoxysilanes, or oligomers thereof, and a water soluble polymer, under conditions where phase separation occurs at least concurrently with gelation, followed by treatment of the resulting gel with a matrix dissolving agent. Nakanishi875 does not teach that bimodal (i.e. meso/macroporous) silica materials can be obtained by hydrolyzing and condensing an alkoxysilane in the presence of a water soluble polymer. The bimodal structure is obtained only after treatment of the gel with a matrix dissolving agent.

11. Gill describes methods of entrapping biomolecules in siliceous materials prepared from oligomeric polyol silicates such as polyglyceryl silicate (PGS). PGS was prepared by the partial hydrolysis and condensation of tetramethyl orthosilicate (TMOS) to poly(methyl silicate) (PMS), followed by transesterification with glycerol, in a one pot reaction catalyzed by hydrochloric acid or poly(antimony(III) ethylene glycoxide). Specifically, at page 8595-8596, Gill describes the preparation of methyl/ethyl ester and polyol ester precursors as follows:

Poly(methyl silicate) (PMS) and poly(glyceryl silicate) (PGS): TEOS (0.48 mol) was mixed with ethanol (50 mL), and hydrochloric acid (10.4 mL of 0.25 M) was added over 30 min with vigorous stirring; then the mixture was heated to 70 °C for 15 h. Rotary evaporation at 35 °C provided PMS of composition  $\text{SiO}_{1.1-1.2}(\text{OMe})_{1.6-1.8}$  as a clear, viscous liquid. PGS was obtained by adding glycerol (0.38 mol) to the reaction mixture over 1 h, heating to 50 °C, and stirring for a further 40 h. [...] FAB-MS indicated that the product consisted mostly of glyceryl-bridged linear oligomeric polysilicates of DP 5-9.

Various glyceryl silicates ("SiGlc<sub>2-4</sub>") and poly(glyceryl silicates) ("SiO<sub>0.5-1.5</sub>-Glc<sub>0.5-2</sub>") were prepared by this method.

Gill utilizes Bronsted (HCl) or Lewis (poly(antimony(III) ethylene glycoxide)) acid catalysts and water to prepare PGS. Such conditions are ideal for alkoxysilane hydrolysis and, ultimately, condensation to prepare siloxane oligomers and polymers. Gill notes that DP 5-09 oligomers are formed. Thus, Gill prepares mixed alkoxy / siloxy species that he calls PGS. It is not possible to prepare pure alkoxysilanes in a medium containing water, such as hydrochloric acid, particularly when acidic catalysts are present (see C. J. Brinker and G. W. Scherer, *Sol-Gel Science - The Physics and Chemistry of Sol-Gel Processing*, New York, Academic Press, 1990 – p. 116 "Tetraalkoxysilanes, organotrialkoxysilanes, and diorganodialkoxysilanes hydrolyze upon exposure to water vapor"; "Hydrolysis is most rapid and complete when catalysts are employed."; "Many authors report that mineral acids are more effective catalysts...").

12. Diglyceryl silane (DGS) is an example of a polyol-modified silane precursor.

13. We have performed direct side-by-side comparison hydrolysis and condensation reactions of DGS, PGS and TEOS in the presence of polyethylene oxide (PEO, 10K MW) with or without added glycerol. Reactions were performed at pH 5.5 and at pH 11 which represent the ends of the pH ranges that are claimed in the application. The reaction conditions, with the exception of pH, are commensurate in scope with those taught in Nakanishi688 or Nakanishi875 in view of Gill. Experimental details and scanning electron microscopy (SEM) images of the resulting materials are presented as Exhibit C.

14. The results provided in Exhibit C show that the DGS samples 1, 5, 6 exhibit macroporosity and (not shown) mesoporosity. The morphology of the structures varies, but is in all cases open. Sample 2 is not macroporous. Under

these conditions, the gelation occurred prior to phase separation. In order to slow down gelation, one equivalent of glycerol was added while other conditions were kept constant. The retarded hydrolysis rate led to phase separation *prior* to gelation and a macroporous structure was achieved (sample 6). To more broadly show the effect of changing the rate, 1 equivalent of glycerol was added to all of DGS, TEOS and PGS reactions (samples 5, 6, 7, 8 11 and 12). As can be clearly seen, under these conditions only DGS at either pH 5.5 or pH 11 led to macroporous structures, while TEOS and PGS did not. This demonstrates the significance of the pH ranges claimed in the application.

The SEM pictures of TEOS derived silica show that macroporous structures are not formed: with glycerol present, a 2 phase system results that does not cure within 1 day.

PGS does not lead to macroporous silica, irrespective of the presence of glycerol.

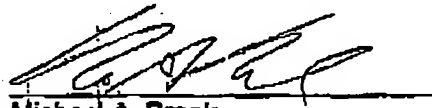
15. The experimental results show that DGS, used in the methods claimed by the present Applicants is fundamentally different from the material(s) prepared in Gill, Nakanishi688 and Nakanishi875. Specifically, in the presence of PEO (10K MW), DGS was the only precursor that provided macroporous material. Accordingly, DGS is not equivalent to PGS or TEOS. Further, in the presence of glycerol and PEO (10K MW) DGS was again, the only precursor that provided macroporous material. Accordingly DGS is not equivalent to PGS plus glycerol or TEOS please glycerol.

16. In summary, I believe that Applicants are entitled to claim a method of preparing bimodal siliceous material by combining polyol-modified silanes with one or more water soluble polymers under conditions where a phase separation occurs before gelation as specified in the amended claims. I am of the opinion that the amended claims are not obvious in view of Gill in combination with

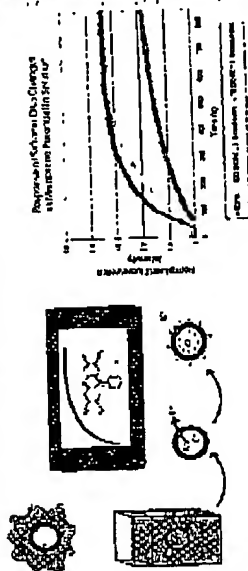
Nakanishi688 or Nakanishi875, since the substitution of DGS for the alkoxyasilanes used in both of the Nakanishi patents would not be expected to provide the bimodal macro/mesoporous siliceous material that is obtained using the method of the present invention. This is substantiated by the fact that experiments performed in our own labs have demonstrated that PGS, when combined with a water soluble polymer in the method as claimed in the Applicants' application does not provide bimodal meso/macroporous siliceous material.

17. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statement and the like so made are punishable by fine or imprisonment or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the Application or patent resulting therefrom.

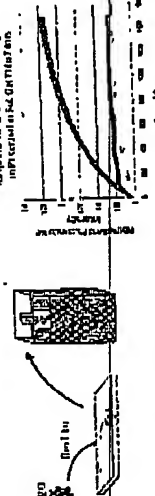
Oct 16, 2006  
Date

  
Michael A. Brook

## Monitoring Ion Mobility by Fluorescence



- Saffranin O's fluorescence intensity is sensitive to membrane potential
- Ion Gradient must create a net negative charge on the interior of the lipid membrane for a fluorescent signal to occur
- Gramicidin allows for passage of  $K^+$ , but not  $Cl^-$
- Liposomes must be created with high intrinsic KCl concentration
- Efflux of  $K^+$  causes membrane potential to increase signaled by an increase in fluorescence intensity
- Same response can be measured for liposomes entrapped in sol-gel thin films



## Conclusions

- Intrinsic membrane protein Gramicidin has been successfully entrapped in sol-gel derived materials, which is demonstrated by Saffranin O membrane potential assay
- Physical and structural properties of Gramicidin still unclear from preliminary intrinsic tryptophan emission spectra

## Future Work and Direction

- Investigation of peptide conformation by circular dichroism
- Study of known inhibitors of ion channel formation and/or function
- Monitor intrinsic tryptophan fluorescence lifetimes of Gramicidin in sol-gel
- Extension of entrapment method to other membrane receptors and enzymes

## The Sol-Gel Process

- (1) Hydrolysis  
 $Si(OR)_4 + H_2O + H^+ \rightarrow Si(OR)_3(OH)_n + nROH$
- (2) Condensation  
 $2Si(OR)_3(OH)_n \rightarrow (OR)_3Si-O-Si(OR)_3 + H_2O$
- (3) Polycondensation  
 $n(Si(OR)_3(OH)_n) \rightarrow [Si(OR)_3(OH)_n]_n$
- (4) Entrapment  
 $[Si(OR)_3(OH)_n]_n + \text{Buffer} + \text{Liposomes}$
- (5) Gelation  
Aging of monoliths or thin films followed by shrinkage

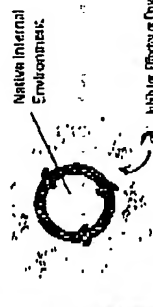
## Advantage of the Sol-Gel process vs. Surface Immobilization

Surface immobilization technique does not utilize internal liposomal environment.

for best, like a ring



Sol-gel method allows entrapment of the entire vesicle with intrinsic membrane proteins in its native form



## Introduction

- Membrane proteins comprise a large fraction of new drug targets
- Isolation and immobilization of these targets is vital for screening for new potential drugs
- Immobilization of model membrane-proteins has been tremendously difficult due to the fragile nature of their structure
- Gramicidin Provides a simple and ideal model system for the development of sol-gel immobilization technique

## Properties of Gramicidin

- Membrane spanning hydrophobic polypeptide
- Forms a ion selective transmembrane channel
- Typically forms a antiparallel dimer with various lipophilic residues, and a pore diameter fluctuations for passage of small cations
- Gramicidin has unique function as a macroscopic lipid bilayer organization
- Structure of Gramicidin is enhanced by lipid chain lengths as well as head group interaction

## Dimeric formation of Gramicidin

## Tryptophan Fluorescence

- Gramicidin contains four tryptophan residues that are very sensitive to local environment
- Blue shift in fluorescence emission is seen with movement to a more non-polar environment
- Due to highly turbid and scattering liposome samples accurate spectra are difficult to obtain. Preliminary results show a red shift in the emission spectrum.



## Acknowledgments

MDS-SOLCX  
J.D. Brennan holds the Canada Research Chair in Biophysical Chemistry

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## EXHIBIT A

**Curriculum Vitae****Michael Adrian Brook****Address**

Home:

165 Charterhouse Cres.  
Ancaster, Ontario  
Canada, L9G 4M4.  
(905) 648-7361

Business:

Department of Chemistry  
McMaster University, ABB 459  
1280 Main St. W.  
Hamilton, Ontario  
Canada, L8S 4M1.  
(905) 525-9140 ext. 23483  
FAX (905)-522-2509  
E-mail: [mabrook@mcmaster.ca](mailto:mabrook@mcmaster.ca)  
Web: [www.chemistry.mcmaster.ca/silicone](http://www.chemistry.mcmaster.ca/silicone)

**Personal Data**

Date of Birth:

November 2, 1955

Country of Birth:

Canada

Citizenship:

Canadian

Marital Status:

Married, 3 children.

**Education**

ETH-Zürich (Swiss Federal Institute of Technology)

1984-85

Postdoctoral Fellowship, Supervisor: Prof. Dr. D. Seebach

McGill University, Ph.D. (Dean's Honour List)

1983

Supervisor: Prof. T.H. Chan (conferred 1984)

Thesis: *The Trimethylsilyl Group in Organic Synthesis*

University of Toronto, Honours B.Sc.

1978

Supervisor: Prof. M. Thompson, 4th year project

Thesis: *The Oxidation Products of 8-hydroxyquinoline with Ceric Ammonium Nitrate*

University of Sussex, UK, Chemistry, first year

1974



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**Current Status at McMaster**

Professor of Chemistry, tenured.

Associate Member, Department of Pathology and Molecular Medicine (1993-2002).

Associate Member, Chemical Engineering (1999-2004).

**Professional Organizations**

Member, Chemical Institute of Canada

Member, American Chemical Society

Member, McMaster Institute for Polymer Production Technology

Member, Brockhouse Institute for Materials Research (McMaster)

**Employment History**

McMaster University, Professor (Promoted July 1997)	1997-
present	
McMaster University, Associate Professor (Promoted July 1991)	1991-97
McMaster University, Assistant Professor (Tenured July 1990)	1985-91
Prof. W.H. Rapson, University of Toronto	1979
<i>Determination of potential mutagenic products of the aqueous chlorination of wood pulp.</i>	
Dr. O. Merecz, Ontario Ministry of the Environment	1978,
1977	
<i>Analysis of polycyclic aromatic hydrocarbons by capillary GC and HPLC.</i>	
Mr. T. Segeren, Chevron Asphalt, Calgary	1976
<i>Analysis of aqueous asphalt emulsions.</i>	

**Consultancies**

Silicone Injection Molding Company, name withheld	2006
Biomaterials Company, name withheld	2005
Jenner and Block, Chicago	2005
Innovalight, St. Paul, MN	2004-
2005	
Inamed CA	2003-
2005	
Digital Persona	2004
Vision Company, name withheld	2003-
2004	
MDS-Sciex, Toronto	2003-
2004	
Dow Corning Corporation, Midland MI	2003-
2004	
Federal Government of Canada (Justice, Health)	2003,
2004	
Kent and McBride, Philadelphia	2003
GenoRx, CA	2003
Strategic Analysis International, Philadelphia	2003

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Surtec, Valparaiso, ILL	2003
Eisenmann, Crystal Lake ILL	2002
Shook, Hardy and Bacon, Kansas City	2001-
2002	
Teltech (now Intota/Sopheon)	1993-
Stroock and Stroock and Lavan, New York	2001
Genencor, Palo Alto	2001
Sasol, Austin TX	2001
Arkmount Systems, Toronto	2000
Xanthon, NC	2000
Gillette, Boston	2000
Shapiro, St. Paul MN	2000
Hatch and Associates, Shanghai	2000
General Electric, Waterford NY	2000
CalEnergy, Calipatria CA	2000
Ballard Power Inc., Vancouver	2000
Dow Corning Corporation, Midland MI	1990-
2000	
Jones Rogers, Toronto	1997-
2000	
Kent and McBride, Philadelphia	1999-
2001, 2003	
Trojan Technologies, London ON	1998-
2000	
CK Witco, Sistersville WV	1999
FEI Technologies, Princeton NJ	1999
Unilever, Port Sunlight UK	1997-98
Tel-Tek/Norsk Hydro, Porsgrunn Norway	1998
Strook and Strook and Lavan, NYC	1997
Eastman Chemical, Kingsport, Tennessee	1997
Albemarle Corp., Baton Rouge Louisiana	1996
Delphax, Mississauga ON	1996
Magnifoam, Barrie ON	1996-97
Lotek, Markham, ON	1995
Price Waterhouse, (for AMT), Toronto	1995
IVACS	1995
Itron, Waseca MN	1994
Trace Sciences	1993
Abitibi Price, Canada	1991-92
S&S Productions	1990
C.I.L. (now I.C.I. Canada)	1988
Galen Pharma (now Biovail, Trimel Lifesciences)	1988-90

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**Scholarly and Professional Activities**

ACS Award Committee, Member (specific award is confidential)	2005-
2010	
<i>Silicon Chemistry</i> (a journal), Regional Editor, The Americas,	2000-
Innovalight, St. Paul, MN, Scientific Advisory Board, Member	2004-
5th Polymerization in Dispersed Media, Lyon France (2004)	2003-4
Member, International Organizing Committee	
Scientific Advisory Board, Ian Wark Research Institute,	
Member, University of South Australia	2002-4
The 3rd International Workshop on Organosilicon Polymers (2003)	2002-3
Member, Organizing Committee, June 23-25, 2003; Rensselaer Polytechnic	
Institute, Troy, NY	
Formulation Days: Silicones and Fluorocarbons, Lyon France, Dec. 9, 10, 2002	
2002	
(Journées formulation silicones et fluorés), Member, Organizing Committee	
Perspectives on Silicon, Ian Wark Research Institute, Adelaide, July 15-19, 2002.	
Member, Advisory Board, University of South Australia	2002
Visiting Professor, Ian Wark Research Institute, University of South Australia	2002
Visiting Professor, Unité Mixte CNRS BioMérieux Lyon, France	2000
Visiting Scientist, Trojan Technologies, London Ontario	1999
<i>Can. J. Chem.</i> Special Issue in honour of Adrian Brook, (pub. Nov. 2000),	
Guest co-editor	1998-
2000	
XXX Organosilicon Symposium, Co-Chair	1997
Visiting Professor, Université de Bordeaux, Bordeaux, France	1996
Visiting Professor, Université Paul Sabatier, Toulouse, France	1996
Visiting Professor, University of Amsterdam	1992-93
74 <sup>th</sup> CIC Chemistry Conference	
Program Co-Chair	1990-91
Abstract Editor	1990-91
Symposium Organizer	1990-91
Conference Chairman, Southwestern Ontario	
Undergraduate Chemistry Conference	1987
<b>Journal Referee (in order of frequency)</b>	
1) <i>Silicon Chemistry</i>	
2) <i>Journal of the American Chemical Society</i>	
3) <i>Langmuir</i>	
4) <i>Canadian Journal of Chemistry</i>	
5) <i>Chemistry of Materials</i>	
6) <i>Biomaterials</i>	
7) <i>Organometallics</i>	
8) <i>Organic Letters</i>	
9) <i>Applied Surface Science</i>	
10) <i>Journal of Polymer Science Part A: Polymer Chemistry</i>	
11) <i>Applied Organometallic Chemistry</i>	

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- 12) J. Chem. Soc., Dalton Transactions
- 13) AIChE Journal
- 14) Science
- 15) Journal of Materials Chemistry
- 16) Artificial Organs
- 17) Journal of Inorganic Biochemistry
- 18) Australian Journal of Chemistry
- 19) Tetrahedron Letters
- 20) Journal of Organic Chemistry
- 21) Journal of Organometallic Chemistry
- 22) Synlett
- 23) Inorganica Chimica Acta
- 24) Chemische Berichte
- 25) Journal of Physical Organic Chemistry
- 26) Tetrahedron Computer Methodology

**External Grant Reviews (in order of frequency)**

- 1) NSERC Research Grants
- 2) NSERC Equipment Grants
- 3) Canadian Foundation for Innovation Review Chemistry Panel CFI Panel (Nov. 2001)
- 4) Canadian Institutes for Health Research grant review
- 5) NSERC Industrial Partnerships Program (CRD/IOR)
- 6) NSERC Strategic Grant
- 7) National Science Foundation (USA)
- 8) American Chemical Society, Petroleum Research Fund (PRF)
- 9) Killam Fellowship
- 10) US-Israel Binational Science Foundation

**Government Panels**

Expert Advisory Panel on Breast Implants, Therapeutic Products Directorate,  
Medical Devices Bureau, Health Canada, member, 2002  
Scientific Advisory Panel on Breast Implants, Therapeutic Products Directorate,  
Medical Devices Bureau, Health Canada, member, March 2005  
Expert Advisory Panel on Breast Implants, Therapeutic Products Directorate,  
Medical Devices Bureau, Health Canada, member, public panel, Sept. 2005

**Areas of Interest****Organosilicon Chemistry**

Silicon-biopolymer copolymers, Organofunctional silicones, Silica surface  
modification, Silicone Polymers,  
Protein entrapped in silica and silicones (immobilized enzymes), Silane coupling  
agents,  
Reactive Silicon Species

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**Other Interests**

Ocular Materials, Oral Vaccines, Functional Colloids, Synthesis of Novel Polymers,  
Synthetic Organic Chemistry

**Honours**

Killam Fellowship (Canada Council of the Arts)	2003-
2004	
President's Award for Instruction (McMaster)	2003
McMaster Student's Union Teaching Award (Faculty of Science)	2002,
1997	
Invited Professor, Ian Wark Research Institute, University of South Australia	2002
Gold Key Honour Award, McMaster University	2000
Invited Professor, Unité Mixte CNRS BioMérieux Lyon	2000
Nomination for McMaster Students Association Teaching Award	2001,
1999	
	1998, 96,
94	
Synergy Award, Conference Board of Canada, NSERC	1996
with Mark R. McDermott and Connaught Laboratories, one of 4 annual Canada-wide awards	
(Award given for Industry-University collaboration)	
Invited Professor, Université de Bordeaux, Bordeaux, France	1996
Invited Professor, Université Paul Sabatier, Toulouse, France	1996
Invited Professor, Universiteit van Amsterdam, Netherlands	1992-93
Dutch National Science Foundation Foreign Researchers Award	1992-93
(NWO Bezoekersbeurs)	
IUPAC Travel Award	1991
Ichikizaki Travel Award for Young Chemists	1988,
1990	
NSERC Canada University Research Fellowship	1985-95
NSERC Canada Postdoctoral Fellowship	1984-85
NSERC Canada Postgraduate Scholarship	1979-83
T. Sterry Hunt Award (McGill)	1979-80
Society of Chemistry and Industry Gold Key	1978
Gollop Award in Chemistry (Toronto)	1978
S.H. Jane Silver Medal (Toronto)	1977
ACS Undergraduate Award in Analytical Chemistry	1977
Ontario Scholar	1974

**CO-WORKERS****M.Sc. students**

STUDENT	YEAR(S)	TOPIC	CURRENT
STATUS			
Lihua Liu	2004	Biopolymer modified silicones	
Lucy Ye (with Bob Pelton, Chemical Engineering)			
	2004	Bicompatible TiO <sub>2</sub>	

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Hazem Amarne	2004	Boronates as structuring agents	
Weian Zhao	2004	Functional Colloids	
Dave Thompson	2003-05	Tethered nucleotides	
Sanela Martic	2003-05	<i>An Investigative Study of Silicon-Based</i>	M.Sc.,
Ph.D. Queen's		<i>Materials as Alternative Matrices for Maldi-Tof Applications</i>	
Kui Guo	2001-04	Protein in Sol Gel Silica	Ph.D.,
Forrest (Li) Gan	2001-03	Silicone peptides	
McMaster			
Cindy Liu	2001-03	Tris-Modified Silicone Surfactants and Their Interactions with Proteins	Vancouver,
Scientist			
Paul Zelisko	1999-01	Silicone-protein copolymers	Ph.D.,
McMaster			
Amro Ragheb	1999-01	Anti-fouling coatings	Ph.D.,
McMaster			
David Valentini	1994-96	Scientist, Glaxo	
		<i>The coupling of synthetic and biological polymers: silicone - starch composites</i>	
David Bayles	1994-96	<i>Towards an <math>\alpha</math>-silyl cation</i>	Ph.D.,
McMaster			
Grant Crowe	1992-94	<i>The <math>\beta</math>-effect of extracoordinate silanes</i>	Scientist,
Apotex			
Tom Stefanac	1992-94		Scientist,
Allelix			
		<i>Silane based radical polymerization: functionalized homopolymers and copolymers</i>	
Mike Roth	1992-94		Scientist,
PMC Film			
		<i>Controlled formation of new Si-based polymeric systems</i>	Tottenham,
Ont.			
Graham McGibbon	1989-91		Scientist,
Boeinger-			
		<i>Gas phase measurements of the <math>\beta</math>-effect for vinyl cations</i>	Ingelheim,
Montreal			
Weifeng Yu	1988-91		Scientist,
EPA			
		<i>The roles of ligands on silicon</i>	
Oakville			
Andrea Osterroth	1988-90	<i>Poly(methyl methacrylate) sterically stabilized with silicones</i>	
		(co-supervised with R.H. Pelton, Chemical Engineering)	

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Thomas Sebastian Zenon	1987-89	Polytrichlorosilylstyrenes	Scientist, Environ., MBA
Burl. ON Mahmud Hadi	1986-88	The $\beta$ -effect	
<b>Ph.D. students</b>			<b>CURRENT</b>
<b>STUDENT</b>	<b>YEAR(S)</b>	<b>TOPIC</b>	
Dave Thompson	2005-	Silicone-modified saccharides	
Forrest (Li) Gan	2003-	Stereoselective reduction	
Elodie Pacard	2002-05	Colloidal Silica Aggregates	
		Joint with Christian Pichot, ENS-Lyon France	
Amro Ragheb	2001-05	Controlling Protein-Silicone Interactions	With
Poly(Ethylene Oxide)			
Paul Zelisko	2001-05	Silicone-protein copolymers	
Masaaki Amako	2001-04	Organometallics in silicones	
Mustafa Mohamed	1996-01	Surface modification by silane photolysis	
Sonya Balduzzi	1995-01	Functional silane and cobalt protecting groups	
Ahmed Alzarnly	1999-00	Silicone-protein copolymers	withdrawn
Frank Laronde	1995-00	C <sub>2</sub> -symmetric Lewis acid catalysts: The role of imidazole in the stereoselective hydrosilylation of carbonyl compounds.	Scientist MDS
		Proteomics	
Rodica Stan	1994-99	Synthesis of novel organofunctional silicones and silanes for interface control	Scientist, GE, WV
Vasiliki Bartzoka	1994-99	Silicone-protein interactions	Scientist,
Taro Chem..			
Mark Stradiotto	1995-99	The dynamics and reactivity of $\eta^1$ -indenyl complexes (co-supervised with M. J. McGlinchey)	Asst.
Prof. Dalhousie			
Paul Charpentier	1993-97	Supported Metallocene Polymerization Catalysts	
		PDF Duke	
		(co-supervised with with A. Hamielec, Chemical Engineering)	
Ralph Ruffolo	1992-97	Silanes and allylsilanes as possible precursors for transition metal-stabilized silylium ions	(co-
		supervised with with M. J. McGlinchey)	M. Environment ON
Howard Ketelson	1992-96	The colloidal stability and surface chemistry of Stöber silica	
		(co-supervised with R..H. Pelton, Chemical Engineering)	
		Scientist, Alcon	

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[illegible]



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Christophe Le Roux Toulouse	1993-94	Radical Reactions of Hydrovinylsilanes,	CNRS,
C.-K. Yeom Membrane	1992-94	Pervaporation Membranes	Korean Company PDF,
Hari Gupta McMaster	1992-93	Silicone Membranes	PDF,
Pankaj Modi McMaster	1991-92	Oligosilylstyrenes, composite membranes	PDF
Wei Li China	1991-92	Membranes from silicones	Scientist,
T. Mancilla-Percino CINVESTAS	1990-91	$\beta$ -effect; Friedel-Crafts with ketones	Prof. Mexico City Scientist,
Stefan Müller BASF	1988-89	The $\beta$ -effect; Friedel-Crafts with ketones	Germany.

**Technicians**

STUDENT STATUS	YEAR(S)	TOPIC	CURRENT
Renita D'Souza	2004		
Kui Guo	2001	Silica Sol Gels	
Cindy Liu	2000	Chelating silicones	
Tom Stefanac student	1994	Recycling silicone	see M.Sc.
Chunfeng Guo	1991-3	Coupling reagents, glass coatings Parkhurst Knitwear	

**Summer Students/In Course Students**

STUDENT STATUS	YEAR(S)	TOPIC	CURRENT
Aid Atlic	2005	Silicones by enzymes	
Amélie Burleraux	2005	Non-bleeding silicones	
Jill Ranger student	2003-5	Proteins and silicones	4 <sup>th</sup> year
N. Oakley	2004	Sterically bulky silicones	
S. Krakar	2004	Non-leaching silicone gels	
L. Tran	2004	Enantioselective reduction	
Meghan Marshall	2003-4	Western Blots of Proteins on Silicone (with H. Sheardown)	2003
Lisa Wilkinson Queen's	2003-4	Silica aggregation	4 <sup>th</sup> year student

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Lee Freiburger student	2003-4	Metallomesogen synthesis	3rd year
Renita D'Souza	2002-4	Silica formulations (done in school year AND summer)	
Mike Hrynyk summer)	2002-4	Proteins in silicone rubber (done in school year AND summer)	
Joanne Poloczec student	2003	Borosilylation (with Steve Westcott, Mt. Allison)	3 <sup>rd</sup> year
Stefanie Mortimer student	2003	Proteins on modified silica surfaces	4 <sup>th</sup> year
Aoife O'Carroll student	2003		3 <sup>rd</sup> year
Jonathan Schinkel Allison	2003	Metallomesogen synthesis	4 <sup>th</sup> year student Mt.
Susan Jo student	2003	Drug delivery from silicone elastomers	2 <sup>nd</sup> year
Cynthia Kwong summer)	2002-3	Cleaning contact lenses (done in school year AND summer)	
Ken Mak	2002-3	New silicone emulsions (done in school year)	
Allison Chapman	2002	Contact lens cleaning	
Stefanie Mortimer	2002	Proteins on modified silica surfaces	
Michele Riordon	2002	Silicone-protein conjugates	
Meaghan Walsh	2002	Sol-gel protein in silica	
Jannine Crowley	2001	Silicone Emulsions	
Meaghan Walsh	2001	Enzyme Emulsions	
Laveena Munshi School	2001	Chelating Silicones	Medical
Jannine Crowley	2000	Anti-fouling Coatings	
Ines Alonso Bilbao	2000	Silicones and Steric Stabilization	Ph.D.
Andre Lapierre Pittsburgh	2000	Enantioselective Reductions	Ph.D.
Krista Kerr	1999	Enantioselective ketone reduction	
Dino Alberico Guelph	1999	Thermoplastic elastomeric silicones	Ph.D.
Bryan Davies McMaster	1998	Chelating Silicones	3 <sup>rd</sup> Year
Friedrika Becker Duisburg	1997	Ethylene Oxide Sterilization of Silicones	Ph.D.
Marko Baller	1997	Decouplable Coupling Agents.	Ph.D. Basel
Bryan Davies McMaster	1997	Silicone Wood Composites	2 <sup>nd</sup> Year
Stacey Bridges Student	1996	Wood-PE Composites	Grad.
Denny Lin Toronto	1995	Chiral tartrate silanes	M.Sc.

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Herman Yang	1994-96	DMSO for D <sub>3</sub> production	Quantum
Computers			
Hanan Atala	1994-95	Amino acid derived surfactants	
Helen B. Penny	1992	Hydrosilanes	PDF
Ralph Ruffolo	1992	Tartrate modified silicones	
Toronto			Scientist,
M. Tomaszewski	1987	The $\beta$ -effect; Acylation	Thera.,
BioChem.			
Laval			Scientist,
Patricia Falletta	1986-87	Polysilylstyrenes	Scientist,
CCIW			Scientist,
Jennifer Townsend	1986	Polysilylstyrenes	of
Ont. Min.			
Environment			Ph.D.
Axel Neuy	1988-89	$\beta$ -effect	Duisburg,
Universität			
Germany			SurTec
Peter Hülser	1985-86	The Silicon $\alpha$ - and $\beta$ -Effects	Germany.
Gmbh,			
<b>Fourth Year Project Students</b>			CURRENT
STUDENT	YEAR(S)	TOPIC	
STATUS			
Stephanie Krakar	2004	Oligocarboxylate silicones	
Jill Ranger	2004	Surface bound nucleosides	
Stefanie Mortimer	2003	Heparin delivery	M.Sc., N.
Carolina			
Lauren Scott	2003	Antithrombogenic surfaces	M.Sc., UBC
Andy Cleaver	2000	Enantioselective Reductions	
Ines Alonso	1999	Silicones and Steric Stabilization	
Andre Lapierre	1999	Enantioselective Reductions	
Dwayne Stresman	1998	Siloxycarbenes (with J. Warkentin)	
Dino Alberico	1998	Cp-silicones, thermal crosslinking	
Gladys Chan	1998	Protein-Silicone Latexes	Medical
school			
Joerg Urschey	1997	Fluorescent Silicones	
Andrea Straatmann	1997	Water borne coupling agents	
Armin Schneider	1996	Hydrosilation catalysts	
		Diplomearbeit, Duisburg	
Jeff Kent	1996	Enzymes on Silicone Surfaces	

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Alex Andronov	1995	Amphiphilic Polymers	M.Sc.
Berkely			
Hanan Atala	1995	Diels-Alder Based Coupling Agents	Ph.D.
Thomas Kuhn	1995	Inorganometallic Polymers	
Duisburg			
Andrew Stadler	1994	Organomodified silicone colloids	
Jay Atanasoff	1994	Pt hydrosilation	Ph.D.
Chris Roos	1993	Silanone from thermal decomposition	
Frankfurt			
Dagmar Ulbrich	1993	Pausen Khand Reactions Using Disilyl-dicobalt	Ph.D.
Frankfurt,			
		Alkyne complexes	Germany
Jason Bernais	1993	Silicone-cellulose copolymers	MBA
Mike Roth	1991	see M.Sc. student	
Bjorn Ramacher	1991	Tetrakis(trimethylsilyl)alkynylsilanes	Ph.D.
Duisburg			
Rick Barker	1990	Silicone stabilized colloids	Scientist,
Pioneer			Balloon,
Stoney Creek			
Ralf Jueschke	1989	The $\beta$ -effect; Diastereoselectivity	Ph.D.
Duisburg			
Bernhard Hladik	1989	Silicone radical reactions	Ph.D.
Duisburg			
Stefan Wenzel	1990	Silylstyrene condensations	Ph.D.
Duisburg			
Daniel Chau	1989	Slow release drugs	Newalta
Corp.			
Sean Guenette	1988-89	Slow release drugs	Ph.D.
Ottawa			
Axel Neuy	1988-89	The $\beta$ -effect	Ph.D.
Duisburg			
Christina Kremers	1987-88	Silane polymers and chiral silaheterocycles	Ph.D.
Duisburg			
Elizabeth Jefferson	1987-88	The $\beta$ -effect with Styrylsilanes	PDF,
Toronto			
George Elia	1986-87	Mechanism of Mukaiyama Reaction	
Patricia Falletta	1986-87	Polysilylstyrenes,	Scientist,
CCIW			
Peter Hülser	1985-86	The Silicon $\alpha$ - and $\beta$ -Effect	SurTec
GmbH,			Germany.

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**Research Funding**

Applications (Type O= Operating, E = Equipment, I = Infrastructure, MI = Major Installation, C=Contract)

<u>Applicants</u> <u>Year</u>	<u>Title of Project</u> , <u>Grantor</u>	<u>Type</u>	<u>Amount</u>
	<b>Biomimetic Intraocular Lens Surfaces for Minimization of Posterior Capsule Opacification, NSERC</b>	<b>CHRP</b>	
Brook, M. A. 2006 Cappretta, A.	HPFC Chromatograph, NSERC	E	29,604
Brook, M. A. 2006	GPC Chromatograph, NSERC	E	86,610
Sheardown, H.D. PDMS Based Keratoprosthesis In vitro and in vivo 2006-2010 Brook, M.A., CIHR (Brook portion, \$35K) West-Mays, J.		O	142,500
Brook, M. A. 2006-11	Silicone Biocompatibility from Interfacial Control NSERC	O	115500

**Research Funding**

Funding Held (Type O= Operating, E = Equipment, MI = Major Installation)

Brook, M.A. 2006 Ganachaud, F.	Biocompatible, Thixotropic amphiphilic silicones as retinal tamponades, Ambassade de France (exchange Montpellier)	Travel	10,000
Pelton, R.H. 2006-10 Brook, M. A. 18 others	Sentinel: The Canadian Research Network on Bioactive Paper, NSERC, Brook portion 5%	O	10,000,000
Brook, M. A. 2005 Sheardown, H.D.	Intraocular lenses, AMO	Grant	157500
Sheardown, H.D. PDMS - Hydrogel Interpenetrating Networks as 2004-05 Brook, M. A.	Ophthalmic Biomaterials	12I	125000

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<i>Brennan, J.D.</i> 2004	Mercury Porosimeter for Characterization of	RT1(E) 88,419
<i>Brook, M. A.</i>	Macroporous Silicas, NSERC	
<i>Brook, M. A.</i> 2004	Silicone-Protein complexes: Using molecular affinity to clean surfaces, Alcon Lab. (US 100000)	O 130000
<i>Brook, M. A.</i> 2004	Anti-fouling surfaces to reduce clotting (provided by J. Weitz, Hamilton Health Sciences	O 20000
<i>Brook, M. A.</i> 2003	Dow Corning Toray Silicones Silicone Liquid Crystals (M. Amako)	O 89000
<i>Brash, J.</i> 2003 +3 others	Gamma Counter, NSERC	E 39405
<i>Brennan, J.D.</i> 2003-6	Development of Mesoporous Monolithic Columns for	CRD $1.0 \times 10^6$
<i>Brook, M. A.</i> <i>Pinto, D.</i> <i>Volmer, D.</i> <i>Covey, T.</i>	High Throughput Proteomics Applications NRC.NSERC, with MDS-Sciex BROOK PORTION (37%)	
<i>Sheardown, H.</i> 2003,4	PDMS Based Artificial Corneas – Cornea Epithelial	O 110000
<i>Griffith, M.</i> 2005	and Stromal Cell Interactions and Device Design	120000
<i>Brook, M. A.</i>	NSERC CHRP (40%)	
<i>Sheardown, H.</i> 2003-2006	Silicone Lenses for the Mitigation of Scarring	O 70000
<i>Brook, M. A.</i> <i>Wong, D.</i>	Following Corrective Laser Eye Surgery Materials & Manufacturing Ontario (Brook portion 40%)	
<i>Brook, M. A.</i> 2001-2005 Control, NSERC	Silicon at the Interface: Synthesis Directed to Interfacial	O 74500
<i>Brook, M. A.</i> 2003	Silicone-Protein complexes: Using molecular affinity to clean surfaces, Alcon Lab. (US 100000)	O 155000

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Brook, M. A. 2002	Silicone-Protein complexes: Using molecular affinity to clean surfaces, Alcon Lab. (\$US 80000)	O	120000
Brook, M. A. 2001-2002	Dow Corning Toray Silicones PhD Research Student Funding (M. Amako)	O	25000
Brook, M. A. 2001	International Collaborative Travel Grant, CIHR (+ living expenses in France up to 2 months paid by CNRS)		1600
Brook, M. A. 2001	Silicone-Protein complexes: Using molecular affinity to clean surfaces, Alcon Lab.	O	90000
Brook, M. A. 2001	Protein-Containing Emulsions in Mucosal Immunology	O	84750
McDermott, M. 2002	NSERC CHRP.		89750
2003			84750
Organ, M. 2001-3	Accelerating Drug Discovery Using Frontal Affinity	CRD	1.6x106
Brook, M. A. Brennan, J.D. Schriemer, D. 2001-3	Chromatography/Mass Spectrometry, NSERC, with INH with MDS-Sciex BROOK PORTION		100000
McCarry, B. E. 2000	Biomolecular Interactions, Ontario Innovation Trust	MI	5,190,000
Brook, M. A. (16 others)			
McCarry, B. E. 2000	Biomolecular Interactions, CFI	MI	5,190,000
Brook, M. A. (16 others)			
Harrison, P. 2000	FT-IR System for <i>in-situ</i> Reaction Monitoring, NSERC	E	106145
Warkentin, J. McGlinchey, M. Brook, M. A. Berti, P.			

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Valliant, J.F.

Brook, M.A. 2000	300 MHz CP-MAS NMR Spectrometer, NSERC	MI	336800
Harrison, P.H. Bain, A., Leigh, W.J. McGlinchey, M.J. Epand, R.; Valliant, J.F.			
Brook, M. A. 2000-2001	Reduced Fouling Quartz Surfaces for UV Sterilization of Water, Material & Manufacturing Ontario	O	40000
Pelton, R.H. 1999-2003	Calcium Carbonate Adhesion to Paper, Mintech Canada,	O	35840
Brook, M.A.	Grant-in-Aid (13 hours/month)		
Brook, M. A. 1999-2000	Reduced Fouling Quartz Surfaces for UV Sterilization of Water, Trojan Technologies Inc.	O	10000
Brook, M. A. 1999-2000	Reduced Fouling Quartz Surfaces for UV Sterilization of Water, Material & Manufacturing Ontario	O	70000
Pelton, R. H. 1999-2002	Calcium carbonate adhesion to paper, Mintech Canada	O	30,000
Brook, M. A.			
Brook, M. A. 1999	Silicone Spreading, Unilever Research	C	6500
Terlouw, J. K., 1998	MS Infrastructure	I	498000
Brook, M. A. 1998	Silicone Membranes, Tel-Tek Norsk Hydro	C	28000
Brook, M. A. 1998	Modifying Quartz Surfaces, Trojan Technologies	C	13462



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Brook, M. A. 1998-2000	Dual Functionality Coupling Agents for the Fabrication of Wood-Plastic Composites, Material & Manufacturing Ontario	O	80000
Brook, M.A. 1997	Silicone sterilization with EO OCMR and Walsh Medical Devices	O	22000
Brook, M.A. 1997-2000	Functional Silane Coupling Agents : Grafting Incompatible Materials and Anchoring Transition Metals, NSERC Operating, 40 hr.	O	44000
Brook, M.A. 1997	Wood/Recycled Polyolefin Composites, OCMR	O	20000
Lott, J. 1996 Brook, M.A. (one of several major applicants)	Environmental Microscope, NSERC, Major installation	MI	633481
Kramer, J. M. 1996 Brook, M.A. Ford, D. Schwarz, H. Yang, D.	Molecular Modelling Software and Computer, NSERC	E	47710
Brook, M.A. 1996	Wood/Recycled Polyolefin Composites, OCMR	O	50000
Brook, M.A. 1994-6	Microparticle Delivery Systems for Immunogenic Agents, NSERC CRD Matching Funds	CRD	64500
Brook, M.A. 1995	Wood/Recycled Polyolefin Composites, OCMR	O	60000
Brook, M.A. 1995-96 Dickson, J. M. (50% Brook)	Novel Membranes, Ontario-Singapore Technology	O	92000
Brook, M.A. 1995-7 Pelton, R. (50% Brook)	Silicone Modified Papers, MODO	O	21000

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Brook, M.A. 1995-6 McDermott, M. Agents, URIF Matching Funds, (50% Brook) Underdown, B.	Microparticle Delivery Systems for Immunogenic	O	122000
Brook, M.A. 1994-6 McDermott, M. Connaught Laboratories (50% Brook) Underdown, B.	Oral Immunization Delivery Systems,	O	120000
Brook, M.A. 1994 Pelton, R. Winnik, F., Stöver, H.	Dynamic Light Scattering Apparatus, NSERC,	E	105197
Brook, M.A. 1994	Silicon based Polymerization Initiators, OCMR	O	35000
Brook, M.A. 1994	Oral Immunization Delivery Systems, Connaught Lab.	O	120000
Brook M.A. 1993-96	Stereocontrol and Silicon: Application to Organic and Polymer Synthesis, NSERC	O	31000
Brook, M.A. 1993-	Silicon based Polymerization Initiators, OCMR	O	20000
Stöver, H.D.H. 1992 Brook, M.A.	Differential Scanning Calorimeter, Thermalgravimetric Analyzer, NSERC	E	71559
Brook, M.A. 1991	Oligosilylstyrenes as Glass Coating Materials, OCMR	O	15500
Brook, M.A. 1990-92 Dickson, J.	Pervaporative Membranes, URIF Matching Funds (50% Brook)	O	57000
Brook, M.A. 1990-92 Dickson, J.	Pervaporative Membranes, NSERC CRD Matching Funds (50% Brook)	O	54000
Brook, M.A. 1990-92	Pervaporative Membranes, ICST	O	45000

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Dickson, J.	(50% Brook)		
Brook, M.A.	Organosilicon compounds: From the $\beta$ -effect to Polymers,	O	30000
1990-92	NSERC		
Brook, M.A.	Polymers, OCMRO	4500	1989
Brook, M.A.	Silicone Polymers, Dow Corning	O	6500
1989			
Brook, M.A.	Gel Permeation Chromatograph, NSERC	E	54260
1989			
Brook, M.A.	Sterically Stabilized Particles, Xerox	O	5000
1988			
Pelton, R.	(50% Brook)		
Brook, M.A.	Glycol-Silicone Polymers, J.P. Bickell Foundation	O	12500
1988			
Brook, M.A.	Chiral Manifolds & Lewis Acids: Organosilane	O	30000
1988-89	& Titanium Compounds, NSERC		
Brook, M.A.	Oligotrihalosilylstyrenes: & Polymer Blending Agents	O	12500
1988	OCMR		
Brook, M.A.	Polysilylstyrenes, MIPPT	O	5000
1987-90			
Brook, M.A.	Silicone Coating Materials, SEED (E + IC)	O	2600
1987			
Falletta, P.			
Brook, M.A.	Organosilicon Compounds Bearing Chiral Ligands:	O	2500
1987	Synthetic Applications NATO		
Brook, M.A.	Lewis Acids in Enantioselective Organic Synthesis	O	13000
1987	McMaster University		

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Brook, M.A. 1986	Polysilylstyrenes, MIPPT	O	2000
Brook, M.A. 1985-87	The Application of the Trifluorosilyl Group to Organic Synthesis NSERC	O	17280
Brook, M.A. 1985	Lewis Acids in Organic Synthesis, McMaster University	O	15000

**Lifetime Publications (Green – undergraduates; Red = graduate students; BLUE = PDFs)**

**Peer Reviewed**

**(a) Books**

- 1 B BROOK, M. A. *SILICON IN ORGANIC, ORGANOMETALLIC AND POLYMER CHEMISTRY*, WILEY: NEW YORK, 2000, 608 pages, (704 including tables, and indices, SOLE AUTHOR).

**(b) Contributions to Books**

6. F M. Liu, A. Ragheb, P. Zelisko, and M. A. Brook, *Preparation and Application of Silicone Emulsions Using Biopolymers*, In *Colloidal Biomolecules, Biomaterials, and Biomedical Applications* (Surfactant Science, Vol. 116), Elaissari, Abdelhamid, Ed.; Marcel Dekker Inc., 2004, Chapter 11, pages-309-329, invited manuscript.
5. N Laronde, F.; Brook, M. A. *Amino acid catalysts for the enantioselective hydrosilane reduction of carbonyl groups*, In *Catalysts for the Fine Chemical Synthesis, Vol. 1, Hydrolysis, Oxidation and Reduction*, Roberts, Stan M.; Poignant, G., Eds., 2002, pp. 169-172.
4. F Bartzoka, V.; McDermott, M. R.; Brook, M. A., *Protein-Silicone Interactions at Liquid/Liquid Interfaces*, In *Emulsions, Foams and Thin Films*, Mittal, K. L.; Kumar, P., Eds., Dekker, New York, 2000, Chap. 21, pp. 371-380, Invited manuscript.
3. R Adrian G. Brook and Michael A. Brook, *The Chemistry of Silenes*, Adv. Organomet. Chem., 1996, 39, 71-158.
2. R Michael A. Brook, *1,2-bis-(Trimethylsilyloxy)cyclohexene*, in *Encyclopaedia of Reagents in Organic Synthesis*, L. Paquette, Ed., John Wiley and Sons, Vol 1, 1995, p. 602, invited manuscript.
1. R Michael A. Brook, *tert-Butyl  $\alpha$ -chloro- $\alpha$ -trimethylsilylacetate*, in *Encyclopaedia of Reagents in Organic Synthesis*, L. Paquette, Ed., John Wiley and Sons, Vol. 2, 1995, p. 862, invited manuscript.

**(c) Journal Articles (C = communication, N = Note, F = Full paper, R = Review)**

128. C Ferdinand Gonzaga and Michael A. Brook, *Structured Nanoparticles in Silicone Surfactant Multilayers*, *Angew. Chem. Int. Ed.*, submitted 11/8/2005

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**Accepted for Publication**

132. C Weian Zhao, Yan Gao, Srinivas A. Kandadai, Michael A. Brook\* and Yingfu Li. *DNA Polymerization on Gold Nanoparticles via Rolling Circle Amplification: Towards Novel Scaffolds for Three-Dimensional Periodical Nanoassembly*, accepted *Angew. Chem. Ed. Engl.* Jan 2006.
131. F Elodie Pacard, Michael A. Brook, Amro M. Ragheb, Christian Pichot and Carole Chaix, *Elaboration of silica colloid/polymer hybrid support for oligonucleotide synthesis*, *Colloids Surf. B: Biointerfaces*, accepted, Dec. 2005.
130. F Chen, H., Brook, M. A., Sheardown, H. D., Chen, Y., Klenkler, B. A *Generic Bioaffinity Surfaces*, accepted *Bioconjugate Chemistry* Nov 2005 (ACS ASAP CODEN: BCCHES ISSN:1043-1802. AN 2005:1345621).

**Publications**

129. F Hodgson, Richard J.; Besanger, Travis R.; Brook, Michael A.; Brennan, John D. *Inhibitor Screening Using Immobilized Enzyme Reactor Chromatography/Mass Spectrometry*. *Anal. Chem.* 2005, 77, 7512-7519.
128. Liang, L.; Dickson, J. M.; Zhu, Z.; Jiang, J.; Brook, M. A., *Removal of 1,2-dichloroethane from aqueous solutions with novel composite polydimethylsiloxane pervaporation membranes*. *J. Appl. Polym. Sci.* 2005, 98, 1477-1491.
127. F Chen, H.; Chen, Y.; Sheardown, H.; Brook, M. A. *Immobilization of heparin on a silicone surface through a PEG spacer*, *Biomaterials*, 2005, 26, 7418-1724.
126. C Ragheb, A. M.; Brook, M. A. *Highly stable chymotrypsin entrapped in silicone elastomers*, *Biomaterials* 2005, 26, 6973-6983.
125. F Yang Chen, Zheng Zhang, Xihua Sui, John D. Brennan and Michael A. Brook, *Reduced Shrinkage of Sol-Gel Derived Silica Using Sugar-based Silsesquioxane Precursors*, *J. Mater. Chem.* 2005, 15, 3132 - 3141.
124. F Hodgson, Richard J.; Brook, Michael A.; Brennan, John D., *Capillary-Scale Monolithic Immunoaffinity Columns for Immunoextraction with In-Line Laser-Induced Fluorescence Detection*. *Anal. Chem.* 2005, 77, 4404-4412
123. F Dong, Hanjiang; Brook, Michael A.; Brennan, John D., *A New Route to Monolithic Methylsilsesquioxanes: Gelation Behavior of Methyltrimethoxysilane and Morphology of Resulting Methylsilsesquioxanes under One-Step and Two-Step Processing*, *Chem. Mater.* 2005, 17, 2807-2816.
122. F Sonya Balduzzi, Michael A. Brook and Michael J. McGlinchey, *Diastereoselective Addition of Allyl- and Crotylstannanes to Dicobalt-Complexed Acetylenic Aldehyde*, *Organometallics* 2005, 24, 2617-2627. 121. F Kovarik, Peter; Hodgson, Richard J.; Covey, Tom; Brook, Michael A.; Brennan, John D. *Capillary-Scale Frontal Affinity Chromatography/MALDI Tandem Mass Spectrometry Using Protein-Doped Monolithic Silica Columns*, *Anal. Chem.* 2005, 77, 3340-3350.

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120. F Masaaki Amako, Jonathan Schinkel, Michael A. Brook, Michael J. McGlinchey and James F. Britten, *Rac/meso Transformations of Disiloxane-bis(1-indenyl)-ansa-ferrocenes: An x-ray Crystallographic and NMR Study*, *Organometallics*, **2005**, *24*, 1533-1543.119. F. Xihua Sui, Jorge A. Cruz-Aguado, Yang Chen, Zheng Zhang, Michael A. Brook and John D. Brennan, *Properties of Human Serum Albumin Entrapped in Sol-Gel-Derived Silica Bearing Covalently Tethered Sugars*, *Chem. Mater.* **2005**, *17*, 1174-1182.
118. F Hong Chen, Michael A. Brook, Yang Chen, and Heather Sheardown, Surface properties of PEO-silicone composites: reducing protein adsorption *J. Biomaterials Sci., Polym. Ed.*, **2005**, *16*, 531-548.
117. F Hong Chen, Zheng Zhang, Yang Chen, Michael A. Brook, Heather Sheardown, Protein Repellant Silicone Surfaces by Covalent Immobilization of Poly(Ethylene Oxide), *Biomaterials*, **2005**, *26*, 2391-2399.
116. F Amro Ragheb, Michael A. Brook and Michael Hrynyk, *Highly active, lipase silicone composites*, *Biomaterials*, **2005**, *26*, 1653-1664.
115. F. Masaaki Amako, Jonathan Schinkel, Lee Freiburger and Michael A. Brook, *Silicone Compatible, Siloxane-Supported Organometallic Compounds and Their Catalytic Activities for the Hydrosilylation of Vinylsilanes and Dienes*, *J. Chem. Soc., Dalton Trans.*, **2005**, 74 - 81.
114. F Michael A. Brook, Yang Chen, Kui Guo, Zheng Zhang and John D. Brennan, *Sugar-Modified Silanes: Precursors for Silica Monoliths*, *J. Sol. Gel. Sci. Technol.* **2004**, *31*, 343-348.
113. F Dina Tleugabulova, Andy M. Duft, Zheng Zhang, Yang Chen, Michael A. Brook and John D. Brennan, *Evaluating Growth Mechanisms of Silica Particles using Fluorescence Anisotropy Decay Analysis*, *Langmuir* **2004**, *20*(14), 5924-5932.
112. F Cruz-Aguado, Jorge A.; Chen, Yang; Zhang, Zheng; Brook, Michael A.; Brennan, John D. *Entrapment of Src Protein Tyrosine Kinase in Sugar-Modified Silica*. *Anal. Chem.* **2004**, *76*(14), 4182-4188.
111. F Jorge A. Cruz-Aguado, Yang Chen, Zheng Zhang, Nadine H. Elowe, Michael A. Brook and John D. Brennan, *Ultrasensitive ATP Detection Using Firefly Luciferase Entrapped in Sugar-Modified Sol-Gel Derived Silica*, *J. Am. Chem. Soc.* **2004**, *126*, 6878-6879.
110. F R. J. Hodgson, Y. Chen, Z. Zhang, D. Tleugabulova, H. Long, X. Zhao, M. Organ, M. A. Brook, J. D. Brennan, *Protein-Doped Monolithic Silica Columns for Capillary Liquid Chromatography Prepared by the Sol-Gel Method: Applications to Frontal Affinity Chromatography*, *Anal. Chem.* **2004**, *76*, 2780-2790.
109. F Liang, Liang; Dickson, James M.; Jiang, Jianxiong; Brook, Michael A. *Pervaporation of 1,2-dimethoxyethane from aqueous solutions by crosslinked oligosilylstyrene-poly(dimethylsiloxane) composite membranes*. *J. Appl. Poly. Sci.* **2004**, *92*, 2284-2294.
108. F Liang, Liang; Dickson, James M.; Jiang, Jianxiong; Brook, Michael A. *Effect of low flow rate on pervaporation of 1,2-dichloroethane with novel*

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- polydimethylsiloxane composite membranes. *J. Membrane Sci.* **2004**, *231*(1-2), 71-79.
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**(b) Contributions to Books****(c) Journal Articles****(d) Journal Abstracts****(e) Other, Including Proceedings of Meetings**

- 3 Book Review in *Canadian Chemical News*, 1997, 49 (6), 39, "Organosilicon Chemistry II: from molecules to materials," Auner, N.; Weis, J. Eds., VCH : Weinheim and NY, 1996.
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15. Michael A. Brook, *Protein and oligonucleotide compatible sol-gel preparation and controlled aggregation of primary silica particles*, IUPAC World Polymer Congress, Paris, July 2004.
14. Michael A. Brook, Hong Chen, and Heather Sheardown, *Protein Rejecting Silicone Elastomers for Scar Reduction in the Eye*, Emerging New Materials Research Day, Toronto, June 2003.
13. Michael A. Brook, Stefanie Mortimer, Cindy Liu and Paul Zelisko, *Formulating Emulsions Using Silicone-Protein Copolymers*, International Workshop on Silicon Containing Polymers ISPO 3 Troy, NY, 2003.



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12. M. A. Brook, J. D. Brennan, D. Chen, H. Chen, Z. Zheng, P. Zelisko, S. Mortimer and A. Ragheb, *Harnessing Protein Activity at Silica and Silicone Interfaces*, 36<sup>th</sup> Organosilicon Symposium, Akron, May 2003.
11. Muxin Liu, Elodie Pacard, Amro Ragheb, Paul Zelisko et Michael A. Brook, *Emulsion de silicone eau dans huile : stabilisation par des protéines*, Journées de formulation: Formulation des composés silicones et fluorés: Concurrence ou complémentarité Lyon, France 9, 10 décembre 2002.
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9. Michael A. Brook, Vasiliki Bartzoka, Gladys Chan and Paul Zelisko, *Are Silicones Deleterious to Protein Structure and Function?*, 33<sup>rd</sup> Organosilicon Symposium, Saginaw MI, April 2000, Abstract B-15.
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7. M. A. Brook and Frank J. LaRonde, *Chiral Extracoordinate Silanes: Catalytic, Enantioselective Reduction of Carbonyl Groups*, 32<sup>nd</sup> Organosilicon Symposium, Milwaukee, March 1999.
6. M. A. Brook, R. Z. Stan and A. Tseitlin, *Progress in the Chemistry of Surface Compability*, 5<sup>th</sup> International Conference on Woodfiber-Plastic Composites, Toronto, ON, May 1998, Abstract.
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157. Lucy Ye, Michael Brook, Robert Pelton, *A Platform of Immobilization of Proteins on TiO<sub>2</sub> Nanoparticles*, 92<sup>nd</sup> Annual Meeting Paperweek 2006, Montreal, QC, Canada, oral presentation.
156. Lucy Ye, Michael Brook, Robert Pelton, *Biotinylation of TiO<sub>2</sub> Nanoparticles and Their Colloidal Stabilities* February 6-10, 2006, 55<sup>th</sup> Canadian Chemical Engineering Conference, Toronto, Canada.
155. Peter Kovarik, Thomas R. Covey, Richard J. Hodgson, Michael A. Brook and John D. Brennan\*, *Compound Screening using Capillary Scale Frontal Affinity Chromatography/MALDI Tandem Mass Spectrometry*. 53<sup>rd</sup> American Society for Mass Spectrometry Conference, San Antonio, TX, 2005.
154. Gina Dimopoulos-Italiano<sup>1</sup>, Michael A. Brook, Amro M. Ragheb, M. Kirk Green. *LCMS Analysis of Squalene Derivatives using ESI with Post-Column Addition of Ag<sup>+</sup>* 53<sup>rd</sup> American Society for Mass Spectrometry Conference, San Antonio, TX, 2005.
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130. Brook, M. A. *Breast Implant Lawsuits – A Tempest in a C-Cup?* Rotary Lunchtime Lectures, Feb. 2004, Hamilton.
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120. Paul M. Zelisko and Michael A. Brook, *The Properties Of Human Serum Albumin And Triethoxysilyl-Terminated Polydimethylsiloxane At The Interface Of Water-In-Silicone Oil Emulsions*, 36<sup>th</sup> Organosilicon Symposium, Akron
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106. M. A. Brook, V. Bartzoka, P. Zelisko, M. Walsh *Silicone-Protein Copolymers: Controlling Interfacial and Protein Stabilization*, 1<sup>st</sup> European Silicon Days, Munich, 2001 Abstract B11.
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100. Mustafa Mohamed and Michael. A. Brook, 84<sup>th</sup> Canadian Society for Chemistry Conference, Montreal, 2001, Abstract 1206.
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98. Zelisko, PM; Flora, K; Brook, MA; Brennan, JD., *The Interaction of Silicone and Human Serum Albumin: Stabilisation Against Denaturation at the Interface*, 84<sup>th</sup> Canadian Society for Chemistry Conference, Montreal 2001, Abstract 1163.
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